

REMARKS

Introduction

The present application has been carefully studied and amended in view of the outstanding Office Action dated March 27, 2006, and reconsideration of that Action is requested in view of the following comments.

A petition for a two-month extension of time accompanies this response together with the appropriate fee. Accordingly, the deadline for responding to the Office Action has been extended until August 28, 2006 (August 27 being a Sunday), and this response is therefore timely filed since it was deposited in the mail for First Class Delivery Service on the date certified on the front page hereof.

Status of claims

Claims 1 to 16 are pending in the application, and these claims stand rejected.

Claims 1, 8 and 12 have been amended in this response to the outstanding Official Action.

Basis for Amendments to Claims

Claim 1 has been amended to incorporate the range of mass fractions of silicon carbide within the material of the brake lining as disclosed on page 6, lines 11 to 14 of the specification. The minimum volume fraction of carbon fibers in the uppermost layer exposed to friction is disclosed on page 6, lines 8 to 11, of the specification. The condition that the silicon content in the friction layer is lower than the silicon carbide content is disclosed on page 6, lines 32 to 34 of the specification.

Support for amended Claim 8 is found at page 6, line 14.

Claim 12 has been amended as in claim 1 to incorporate the range of mass fractions of silicon carbide within the material of the brake lining as disclosed on page 6, lines 11 to 14 of the specification. The minimum volume fraction of carbon fibers in the uppermost layer exposed to friction is disclosed on page 6, lines 8 to 11, of the specification. The condition that the silicon content in the friction layer is lower than the silicon carbide content is disclosed on page 6, lines 32 to 34 of the specification.

No new matter has therefore been introduced, and entry of the amended claims is respectfully requested.

The Office Action

Rejection under 35 U.S.C. § 103(a)

Claims 1 to 9 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Krenkel et al, US 6,668,984 ("Krenkel").

Krenkel discloses a friction element for a safety braking device comprising a body formed of a fiber-reinforced ceramic composite material having a matrix of silicon carbide and carbon, which friction element body has a mass fraction ("content in mass percent") of Si in a range of from 2% to 6%. See claim 1, col. 8, lines 30 to 32, and col. 5, lines 23 and 234. Further, the mass fraction of silicon carbide in the friction element body of Krenkel is from 40% to 45% (see col. 8, lines 30 and 31). Nothing is disclosed or suggested about the volume fraction of carbon fibers in the uppermost layer exposed to friction.

It has been found, in the experiments that have led to the present invention, that the combination of a volume fraction of carbon fibers of at least 50% in the uppermost

layer exposed to friction, with the range of mass fractions of silicon carbide of from 10% to 25%, preferably from 12% to 25%, and the range of mass fractions of silicon of from 10% to 25%, preferable from 12 to 25%, with the proviso that in the friction layer, the silicon content must be less than the silicon carbide content, provides a good coefficient of friction and friction comfort, as well. This result from the special choice of ranges of constituents in the material could not have been expected.

It is therefore submitted that amended claim 1 and dependent claims 2 to 9 and 11 are patentable over Krenkel.

While the Dietrich reference teaches shaping by turning (col. 5, lines 59 to 61), and drilling of a hole through the green body of a brake disk (see Fig. 1 and explanation in col. 5, lines 12 to 15, and lines 32 to 35) before pyrolysis, this reference is not directed to brake linings, but brake disks. See col. 5, lines 32 to 35.

The Dietrich reference, however, is silent as to a method of fixing a friction lining to a support plate or lining plate. Therefore, claim 10 is not rendered obvious by the combination of the Dietrich and the Krenkel references.

Claims 12 to 16 stand rejected under 35 U.S.C. § 103(a) over Withers et al US 6,051,167 ("Withers").

Withers is directed to a method of making a carbon composite structure from a matrix of non-crystalline carbon particulate soluble in an organic solvent, a binder comprised of an organic carbon precursor that has a liquid phase, and an organic solvent, forming an uncured structure of that mixture, by combining that mixture with a reinforcement material, and curing the structure, subsequently pyrolysing it in an inert atmosphere, and the pyrolysed object is then subjected to chemical vapor infiltration.

See col. 5, lines 42 to 60, and col. 6, lines 45 to 50. The gaseous infiltrant is typically a metal suboxide. See the section on "Whiskerizing" and the explanation why gaseous Si has to be avoided, due to the large change in molar volume which leads to closure of the pores, ending of further reactions, and fracture or cracking. See explanation in col. 11, lines 1 to 7.

Infiltration with liquid silicon in the form of its melt is not mentioned or suggested by Withers. There is no mention of brake parts, but only of pistons, and Withers teaches away from using silicon, but recommends suboxides such as SiO. Accordingly, there is no motivation of using the process of Withers in the manufacture of brake linings. But even if it were used, it would not lead to the brake linings made by the process as recited in amended claim 12, since there is no disclosure or suggestion regarding the content of silicon and silicon carbide or of the volume fraction of carbon fibers.

Withdrawal of the rejection is therefore respectfully requested.

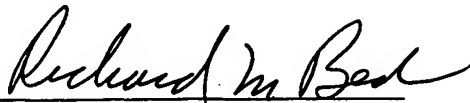
Conclusion

Based on the foregoing remarks and explanations, it is believed that claims 1 to 16 are in condition for allowance. Such action is earnestly sought.

Entry of the amendments is respectfully requested to put the application into better condition for allowance or appeal.

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Respectfully submitted,

By 

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